

# Life History of the Indian Cuckoo, *Cuculus micropterus micropterus* Gould, in the Soviet Union<sup>1</sup>

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(With four plates)

The Indian Cuckoo was described in 1837 by J. Gould from a specimen from the Himalaya. Twenty years later it was for the first time collected in Russia near Blagoveshchensk on the Amur by G. Radde. It was wrongly identified and recorded as *C. optatus* (Radde 1863), and was kept under this name in the collection of the Zoological Museum of the Academy of Sciences in Leningrad for many years. In 1928 Stegmann collected an adult male of the Indian Cuckoo in Amurland as the first record of the species. Later, working with the Museum collection, he 'discovered' Radde's specimen, and included this species in the bird-list of the U.S.S.R. (Stegmann 1930). It is to Stegmann and Radde that we are indebted for our first information on the habits, voice, and habitats of the Indian Cuckoo. Though rather scanty, these data were till now nearly the only source of information for authors of Russian ornithological handbooks and species keys. Very little was known of the breeding biology of the bird, and up to 1957 the eggs and nestlings of the Indian Cuckoo from the USSR were not described, its fosterers remained unknown, and even museum skins were rare in collections.

In the summer of 1957, 1958, 1959, 1961, and 1962 the authoress collected in Amurland new and interesting data which form the basis for the present paper on the life history of this bird.

## DISTRIBUTION

Ignoring the incorrect views of Caldwell & Caldwell (1931), Buturlin & Dementiev (1936), and Belopolsky (1950) on the distribution of the Indian Cuckoo, its breeding range in the Soviet Union may be confined

<sup>1</sup> Following the majority of modern authors I accept the existence of only two geographical forms of the Indian Cuckoo: *C. m. micropterus* and *C. m. concretus*. Comparison of 30 adult birds from the USSR and China with Indian ones has shown that *C. m. ognevi* (Vorobiev 1951) is a synonym of the nominate form.

to Amurland from the valley of Burinda River in the west (Radde 1863) to at least the city of Komsomolsk in the east (Kistjakovsky 1959; Kistjakovsky *et al.* 1962). Within the limits of Amurland, where this cuckoo is recorded as a common and even numerous bird, its distribution at the breeding period coincides nearly exactly with areas having two zonal botanical-geographical complexes: broadleaved-coniferous taiga and broadleaved forest (Sochava 1957). The most northerly points of distribution of this bird in Amurland [the basins of Burinda, Olga, Ushumun, and Tu Rivers, the mouth of Selemdzha River, and Bureja River (Radde 1863); Stegmann 1930; Vorobiev 1951; Kistjakovsky & Smogorzhevsky 1964] nearly reach the northern limit of the most typical oak-larch, and oak-pine forests. In Ussuriland, the Indian Cuckoo is distributed sporadically and in small numbers, predominating in the west of the region. Some records come from the regions of the middle reach of Ussuri River and the lower reach of Bikin River (Vorobiev 1951; Leonovich, *in litt.*) and is also recorded from the lower reaches of Iman River eastward to Kartun village (Spangenberg 1965).

The main breeding area of this species is outside the limits of the U.S.S.R and embraces NE. China (Manchuria), the forest regions of the provinces Hopeh, Shansi, etc. extending southward up to Kwantung and Kwangsi (Vaughan & Jones 1913; Stresemann 1923, 1930; La Touche 1931; Meise 1934; Shaw 1936; Hoffmann 1950). The Indian Cuckoo is also known from Korea but its status there is not clear. Austin (1948) considers it to be an uncommon spring transient, but a few known records of this species (Kuroda 1918; Yamashina 1932) are consistent with its breeding irregularly in Korea. The Indian Cuckoo inhabits India (except the north-western arid regions), eastward to Assam, West and East Pakistan, and Nepal. It is widely distributed in Burma, Ceylon, and apparently in northern Thailand, and is found further south up to the Malay peninsula (Robinson & Chasen 1939; Deignan 1945; Phillips 1948, 1952; Smythies 1953; Ripley 1961).

Nearly everywhere within its breeding range the Indian Cuckoo is a typical migratory species, though in Ceylon and in some parts of India a part of the population is resident. In winter, apart from Ceylon, it is common in small islands in the Strait of Malacca, in the Philippines, Banka, and the Thousand Islands; it winters also in Sumatra, Java, and Borneo where *C. m. micropterus* occurs together with the smaller resident form, *C. m. concretus* (Peters 1940).

#### ARRIVAL IN BREEDING AREA

The Indian Cuckoo leaves its winter quarters very early. In Burma one may hear its characteristic call from the end of January or middle of February (Bingham 1880; Smythies 1953). In Thailand Deignan

(1945) recorded their song on 12 March. In Ceylon the Indian Cuckoo becomes active in March to early April; later, when all winter migrants have left the island for their breeding ranges further north, the summer resident Indian Cuckoos become inconspicuous. According to Hewetson (1956), in India in southern Madhya Pradesh the birds were recorded in March and in northern Madhya Pradesh in May. At the end of March their arrival was noticed in the north-East of the country, in Bhutan (O'Donel 1936); from the beginning of April, in northern Bengal (Storrs 1944; Lister 1954) and southern Bihar (Lowther 1949). In Punjab the earliest arrivals were recorded on 23 April (Whistler 1926). In Nepal the birds are common in April-May (Rand & Fleming 1957; Ripley 1950; Biswas 1960). In China in the second half of April these birds were noticed during their migration in Yunnan (specimens preserved in the collection of the Institute of Zoology, Academia Sinica). In Kwangtung these cuckoos were recorded in the first week of May (Vaughan & Jones 1913); in Fukien, in April; northwards in the provinces Hupeh, Kiangsu, Hopeh, Liaoning, and in north-eastern China, in May (Caldwell & Caldwell 1931; Shaw 1936). According to observations made by A. Hoffmann (1950) the first Indian Cuckoos in Nanking were noticed 28-29 April and in Peking nearly two weeks later, 11-12 May. In the vicinities of these cities these cuckoos were recorded somewhat earlier. Their arrival in 1944-1947 coincided with the appearance of the Blacknaped Orioles in the parks and gardens of Nanking and Peking and preceded by some days the arrival of Common Cuckoos. According to Piechocki (1958) in the suburbs of Peking at the beginning of May the voice of the Indian Cuckoo was not heard. Meise (1934) mentions a male shot in Manchuria near Dshalantun on 29 May. In Korea, in the west of Pyongan Pukto province, these birds were collected during 24-31 May (Kuroda 1918; Yamashina 1932). In Ussuriland (U.S.S.R) along the lower reaches of Iman River, Spangenberg (1965) recorded the earliest song during 27-29 May.

Males commence singing in winter and continue calling on their way to their breeding places. Among palaeartic birds no other species possesses a similar voice; that is why the arrival of the Indian Cuckoo cannot remain unnoticed and the date of the arrival of this bird can be recorded accurately to a day.

According to my records the species arrived on the Amur-Zeya plateau at the same time during five years. Thus, the first male call was recorded near Klimautzy village (NW. of Blagoveshchensk) in 1957, 1958, and 1962 on May 23 and in 1959-1961 on May 24, i.e. 4 days later than the date of arrival of the Common Cuckoo and 2-3 days later than that of the Himalayan Cuckoo. In 1957-1959 in May the weather was rather warm but cloudy, and drizzled occasionally. On the contrary in

1961-1962 the end of May was dry and sunny, and the night temperature fell to  $-5^{\circ}\text{C}$ . The forest started to turn green : larch was covered with young needles, small green leaves began to come out on *Betula platyphylla* growing on the plateau along the sunny hill slopes ; oaks and rhododendrons broke into leaf ; Dahurian Birch (*Betula dahurica*) burst into blossom and its buds swelled. On the first few days of their arrival the Indian Cuckoo males sing little. A strong wind and incessant rain, or a sharp fall of temperature or heat, exerted a negative influence upon their activity. Owing to the lack of food (caterpillars are few and small in size) in spring the Cuckoos had to spend much time in search of food. Single individuals were repeatedly observed awkwardly hopping on the ground in the most sparse and warmed parts of the forest, picking up insects on the leaves of the previous year, in grass, or on the surface of the ground. Apparently, on May 23-24 only the first males arrived ; females were absent till 25-26 May. From May 27 to 28 the number of males and females increased and the rise in their activity became noticeable.

#### VOICE AND HABITS

In Chinese one of the names of this bird means 'four-syllabled cuckoo'. In fact, the very peculiar ringing song of the Indian Cuckoo consists of four sibilant, flute notes repeated one after another, a kind of *fju-fju-fju-fu*. The song is rather melodious and easily memorized. In the far east of the U.S.S.R., in China, India, Burma, and in other countries of south-eastern Asia where the Indian Cuckoo is met with during its breeding or non-breeding time, the local people know this song very well and readily recognise it. Without going into particulars since it was done in detail by A. Hoffmann (1950), I would like to repeat that in the majority of the Asiatic languages the name of this bird has an onomatopoeic etymology (Whistler 1926; Baker 1927; La Touche 1931; Burton 1935; Shaw 1936; Ali 1953; Smythies 1953; etc.). Abdulali (Ali & Abdulali 1938) likens the song of *C. micropterus* to the voice of *Pomatorhinus horsfieldi*.

As in the Common Cuckoo, males of the Indian Cuckoo have individual differences in the key and timbre of the call. Being always four-syllabic, the song may be dull and rough, or clear and ringing. In Amurland the voices of individual males in the majority of cases differed so much that it was rather easy to recognise them and to trace the movements of individual birds all over the territory.

In the south of the Amur-Zeya plateau Indian Cuckoos could be heard all day in the breeding season. In June and the beginning of July the birds did not cease singing even at night. According to my observations, at the end of May and the middle of June males began to



sing before dawn, at 2-2:30 a.m. They sang at intervals which apparently coincided with the feeding times. At 18-18:35 p.m. the birds were active again. Many individuals did not cease singing after sunset. Within the breeding season even prolonged rain accompanied by strong wind did not affect the time and intensity of the singing. It seemed to me that on warm rainy days they called more readily. On the contrary, the long summer drought of 1962, so unusual in Amurland, rather oppressed the birds: some males nearly stopped singing in June, others were heard only early in the morning, at dawn when the air was more humid. However, the recession and rise of activity of Indian Cuckoos depends to a greater extent on their breeding cycle than on the weather. On days preceding copulation and on the days when it takes place males and females are very excited and call often. With the beginning of egg-laying Indian Cuckoos are nearly always silent in their breeding territory.

A male usually sings perched at the very top or on a lateral branch of a high larch or pine tree; sometimes it settles in the crown not far from the main trunk of the tree. Each individual has a favourite place for singing, usually a tall tree. Some other birds living in the neighbourhood (Common Cuckoo, Indian Jungle Nightjar, Eastern Turtle Dove, Whitethroated Rock Thrush, Chinese Greenfinch, migratory Chinese Grosbeak, etc.) show a preference for the same trees. Thus, on 7 June a male of the Indian Cuckoo sang at the top of an old pine three times, from 4 a.m. to 7 a.m. (once with a female), and a male of the Common Cuckoo was heard on the same tree twice. Loud calls of the Indian Cuckoo are audible more than one kilometre away. As distinct from the Common and Himalayan Cuckoos, which before and after cuckooing utter some additional sound, the Indian Cuckoo has no other sound but the main song. While singing the male slightly hangs its wings. When displaying before a female, at the moment of highest excitement, the male spreads his tail in an erect position, slightly moves it from side to side, and begins to call louder and rapidly. Often a male calls even on the wing when chasing the female.

The nuptial call of females is composed of an interrupted warble greatly resembling that of the Common Cuckoo female, but some tones higher. Unlike the male the female is very seldom seen. Usually she hides in a tree crown or perches rather often on a bough like a nightjar and is very difficult to notice. Whereas the male prefers to keep to the very tops of tall trees, usually coniferous ones, a female shows a definite preference for the middle and the thickest part of a tree crown and does not avoid leaf-bearing trees. A cuckoo-hen calls in full measure only when flying; when perching it utters a short and muffled warble.

When frightened or disturbed, Indian Cuckoos instantly fly a long

way off, never to the nearest tree as many other forest birds do. On the wing, the Indian Cuckoo can be easily distinguished from the Common and Himalayan Cuckoos by its fuscous-brown purple-glossed mantle plumage, broad widely-spaced transverse bars on the breast, and short rounded wings (hence its name *micropterus*). Its flight resembles much that of *C. canorus*, but is more swift, with frequent flapping of wings.

Nearly all ornithologists who have had an opportunity to watch the Indian Cuckoo in the Far East have noted its extreme shyness. In my first expedition to Amurland I had the same experience (Neufeldt 1959), in the summer of 1957 I was lucky to shoot one female, and in 1958 with equally great effort two males. In the years that followed, when collection was not so keen and attention was directed to the study of the biology of the bird, we found that it is no more shy than the well-known Common Cuckoo but considerably more mobile. The fact is that the female Indian Cuckoo is constantly moving over its territory, and so accompanying males continually change their singing places. Besides, the male-cuckoo regularly visits every part of its territory singing by turns at set perches. The intervals between such flights are short, usually less than the time the observer must spend for concealment and subsequent watch for the bird. In the meantime the male (the main partner is meant), after flying round the territory, returns again to its original place. Thus, if you know the routes and favourite trees of an individual bird you can judge beforehand where it can be met. It is of interest that males of this species choose the same trees not only within one season but during several years. Keeping this in mind, in the summer of 1962, without any reconnoitring I installed the microphone on the top of an old high pine which was often used by Indian Cuckoos in 1957 and 1958 for singing, and in 40-50 minutes I made a rare tape-recording at short distance of this wonderful bird's voice. We found ourselves misled at times because a male that is not very excited has the habit of interrupting his song without leaving the tree. During such a pause another bird may start singing not far away and when he stops the first starts afresh. Thus, males do not sing in chorus but call to one another. Only when a female appears do the males call all together.

As mentioned earlier Indian Cuckoos begin to sing as early as January in their winter quarters and stop when the breeding season is over. In the south of the Amur-Zeya plateau at the beginning of July their singing was not so intensive and was confined in general to early morning and late evening. In the limits of the territory under study solitary males could be heard up to 8 July in 1957, 10 July in 1958, 6 July in 1959, 11 July in 1961, and 12 July in 1962. In those years Common Cuckoos sang somewhat later, up to 23-25 July. According to Hoffmann's observations in Peking and its environs also, the Indian Cuckoo sings

seldom and one at a time, in mid-July. In India, according to Baker (1927) their calls were recorded before July. Storrs (1944) registered their last song in Bengal on 31 June. In Thailand, these birds whistle up to 7 June (Deignan 1945); in Burma up to June (Smythies 1953); in Ceylon, where the breeding takes place during the winter-spring months, the Indian Cuckoos sing before May (Phillips 1948). The cessation of singing does not mean that the birds have left the breeding area.

#### BREEDING HABITATS AND NUMBERS

The distribution of the Indian Cuckoo during the breeding season depends, as in other parasitic birds, on the distribution of its main fosterers. All Passeres, supposed or known to be foster-parents of the young cuckoos, inhabit sparse portions of forests or old parks. The Indian Cuckoo is also a typical forest inhabitant. In Thailand, for instance, the birds keep to both evergreen and pine forests (Deignan 1945). In India at the breeding period this cuckoo is common in forests at elevations about 1500 m. above m.s.l.; in the Himalayas it occurs sometimes up to 2700 m. (Baker 1927; Brooks 1875; Whistler 1926; Hewetson 1956). In China in Hopeh province the Indian Cuckoo lives in forest regions (Shaw 1936). According to Hoffman's (1950) information, in Peking and Nanking it is very abundant in gardens and parks as well as in neighbouring hill forests. In Manchuria it prefers leaf-bearing and mixed forests. Favourite habitats of the Indian Cuckoo are mentioned by Spangenberg (1965) to be sparse plantings of old birches, oaks, and maples, and other leaved trees covering hills. Vorobiev found this bird in Ussuriland in oak-groves on small hills; Kistjakovsky (1959, 1962) met them not far from Komsomolsk on the Amur in larch taiga. In the western part of Amurland the main biotope of these birds is old pineries with an undergrowth of dwarf oak, growing on hills and along the Amur River bank (Stegmann 1930). At a distance of 40 km. from the Amur River Stegmann met this cuckoo in oak-groves together with the migratory Chinese Grosbeak and the Grey Minivet. Radde (1863) writes that he observed the bird on high pines in the plains between Burinda and Olga Rivers.<sup>1</sup>

According to my observations near the town of Svobodny where larch trees are very abundant in neighbouring forests, Indian Cuckoos at breeding time are confined to stunted oak-larch forests, influenced by fire and cutting. Such forests usually occupy the plateau and its slopes of various steepness and exposure. The Dahurian Larch (*Larix dahuricus*) forming the upper canopy is represented here by very high solitary trees

<sup>1</sup> All Radde's observations on this species are described under his review of *C. optatus*.



usually with dead tops. Occasionally, generally on southern slopes, there are old pine trees. In the second canopy Mongolian Oaks and Birches (*Betula platyphylla* and *B. dahurica*) dominate. The undergrowth is well developed and comprises in general the Hazel, Lespedeza, and Dahurian Rhododendron. In more humid places the admixture of alders and willows is rather significant. Brush and grass cover is rich and variable. On the ground there is plenty of wind-fallen wood and dead twigs. Such parts of the forests represent in general, clearings at different stages of secondary growth and are favoured breeding places of the Amur Brown Shrike, the density of whose population here is 0.5-1.0 and even 2.0 pairs per hectare. In the Shimanovsky district (environs of Simonovo village) the larch is nearly absent. Here the Indian Cuckoos inhabit oak-pine forests with Rhododendron and Lespedeza. Such forests cover terraces of narrow forested valleys and flat elevations. The upper canopy is composed of solitary old pines, in the second canopy oaks and birches prevail. The undergrowth is dense and composed of undersized oak trees, Rhododendron, and Lespedeza. Oak-groves without admixture of high coniferous trees, and very dense deciduous and pine forests without clearings are avoided by this bird. The abundance of Amur Brown Shrikes (*Lanius cristatus confusus* Stegm.), the regular fosterers of the Indian Cuckoo in the Amur-Zeya plateau (Neufeldt 1963), and the presence in both the above mentioned biotopes of the high pine and larch trees, on which male cuckoos perch for singing, make the conditions favourable for the breeding of the cuckoos.

The arrival of Indian Cuckoos at their breeding places in Amurland coincided with the time of pair-formation and occupation of nest sites among the Shrikes. On returning from winter quarters male cuckoos kept to biotopes situated immediately near the nesting ones. By the end of May territories of the cuckoo-hens were distinctly demarcated. One female controlled an area inhabited by 25-30 pairs of shrikes; thus the range of the individual cuckoo's area depended on the population density of the host species. In years when numerous areas of secondary growth provided a high concentration of shrikes, an area of 100-125 hectares in the environs of Klimautzy village (Amurland) was constantly inhabited by Indian Cuckoos: 1957—2 ♀♀, 4 ♂♂; 1958—2 ♀♀, 3 ♂♂; 1961—1 ♀, 2 ♂♂; and 1962—2 ♀♀, 3 ♂♂. (Cases in which territories occupied by the females overlapped have not been taken into account). Very often, due to rugged terrain with complicated network of forest valleys and diversity of plant associations, the territory occupied by one cuckoo-female was considerable and separated into isolated parts situated as much as 100-300 metres from each other.

The associates of Indian Cuckoos and Amur Brown Shrikes inhabiting the same biotopes were Gray's Grasshopper-Warbler, Thickbilled Warbler, Rubythroat, all rather common and numerous in the under-



growth, and the scarcer but still typical forest dwellers, such as Radde's Bush-Warbler, Indian Tree Pipit, and Masked Bunting. Occasionally nesting migratory Chinese Grosbeaks could be seen. The abundance of open-nesting songbirds attracted Common Cuckoos to these biotopes. All the forest valleys were occupied by the Great Spotted Woodpecker, Whitebacked Woodpecker, and Tits.

Long-term observations on Indian Cuckoos undertaken at one territory have shown that these birds are confined to definite parts of the forest and even to individual trees. Unfortunately, I was not able to ring Cuckoos and so to establish individual identity. The return of Common Cuckoos to the same area over a number of years has been proved beyond doubt (Makatsch 1955).

### BREEDING

As stated above, in the territory under observation a preponderance of males over females was noticed every year. The literature shows that this phenomenon, characteristic also of the Common Cuckoo, has contributed to the widespread opinion that the parasitic cuckoo is polyandrous and female mates with several males visiting her territory. On the contrary, some authors (e.g. Harbø & Moebert, cit. Makatsch 1955), on their own long-term observations, have concluded that in the breeding period Common Cuckoos live in pairs. Now we have data indicating that the excess of males over females is not invariable. Thus, Malchevsky (1954) records an equal correlation between sexes or even an excess of females over males. So polyandry seems unlikely. This problem can be solved only by ringing or otherwise marking the birds and making a special study on the composition of their population.

I give below some results of my stationary visual observations on the Indian Cuckoo and state my opinion on its breeding habits. I would premise that, as regards males with distinctive voices, I was dealing with 'marked' individuals.

At the height of the breeding season one female is followed by 1 or 2, sometimes 3, males who frequently visit her territory. But only one male is believed to impregnate her. This male is most often seen near her. On the day of copulation the female's 'chuckle' is heard very often and she repeatedly changes her place flying from one end of the territory to another. It is very significant that in this period the hen's call is a reciprocal reaction to the song of the 'favoured' male, who judging by his activity is considerably more excited than other males in the vicinity. I saw repeatedly the 'favoured' male try to drive out the other males, who apparently took no part in breeding. When laying eggs the cuckoo-hen is especially cautious and silent. But the male is sometimes heard or seen nearby. He flies openly and diverts to some

extent the attention of host-species, thus making the female's task easier. It thus appears that during the breeding season Indian Cuckoos live in pairs. Brood parasitism involves an escape from the chief duties of raising a family : building the nest, incubating the eggs, and rearing the young. Thus the duties of mates become minimal, being limited to the selection of the breeding biotope and its protection, to a timely search for fosterers' nests, and egg-laying. The relation between mates is not so stable as in non-parasitic species of cuckoos, but the female always shows a preference for a definite male and he becomes her partner for the breeding season.

The 'superfluous' males who occur in the territory are, seemingly, one-year old birds come from their winter quarters to the area where they hatched and grew up. Nearly half of the singing Indian Cuckoo males collected in Amurland had, in varying number, unmoulted juvenile secondaries and greater coverts, a fact that indicates a considerable proportion of young males in the population. Owing to the generally unequal correlation of the sexes that is observed in nature, not only in cuckoos but also in many other birds, a number of males (particularly young and less experienced birds) remain unmated in their first year. In regions with great density of population, where several females' territories are contiguous, unmated males in moments of great excitement pursue more than one female. Such a pursuit is common even in birds living in constant pairs. In many perching birds, woodpeckers, and birds of prey, not only unmated but also paired males are lured from their territories by the voice or the display of a female from another pair. Several times I observed the nuptial call of the Indian Cuckoo female attract Common Cuckoo males, but this fact does not prove that Indian Cuckoo females mate with males of another cuckoo species. The idea of polyandry in these birds is, I think, groundless. Finally, I would like to note that the impression of a numerical excess of males over females among cuckoos is probably due to the impossibility of observing all the female cuckoos in an area during a short trip.

The Indian Cuckoo is a typical nest parasite, like the other eleven species of the genus *Cuculus*. Though about two hundred host species of the Common Cuckoo are known, for the Indian Cuckoo only isolated trustworthy records are available. For example, the Azure-winged Magpie, *Cyanopica cyana*, is one of the commonest hosts of the Indian Cuckoo in Peking and its environs (Shaw 1938, 1940; Hoffmann 1950). In northern Bengal this cuckoo's eggs were found in the nests of the Drongo, *Dicrurus macrocercus* (O'Donel 1936; Storrs 1944), and in Sikkim in those of the Spider hunter *Arachnothera magna* (Gammie 1877). In Ceylon the Ceylon Blackheaded Oriole, *Oriolus xanthornus ceylonensis*, is probably a foster-parent of this cuckoo (Phillips 1952). The majority of the data, however, is based on guess-

work and supposition and needs confirmation by observed fact. Sometimes having found an egg ready for laying in the oviduct of a dead bird, ornithologists have tried to determine the host species by matching the colour of the egg's shell. Sometimes an abnormal egg in the nest of a songbird, which differed from the others in shape, size, or colour has been referred to some species of cuckoo. Lastly, some authors have listed as host species of the Indian Cuckoo birds among whom the appearance of the cuckoo near their nest caused anxiety (Ratray 1905; Vaughan & Jones 1913; Nehrkorn 1910 *cit.* Makatsch 1955; Hoogerwerf 1949, *cit.* Makatsch 1955, Spangenberg 1965). In the above mentioned works Drongos (*Dicrurus* and *Buchanga*) are mentioned most often as the host-parents of the Indian Cuckoo.

In the U.S.S.R., in Amurland, the egg of the Indian Cuckoo was first found by me in the nest of the Amur Brown Shrike in 1957. The astonishing similarity in the coloration of the eggs of the two species, as well as an obvious adaptation of Indian Cuckoos to the nesting-biotopes of the shrikes in the investigated territory, had long since suggested that the connection between these two species is not accidental. The additional material collected by me in the same region of Amurland now enables me to state quite definitely that this species of shrike is the main, and apparently the single, host of the Indian Cuckoo in this part of its range. Further avifaunistic investigations in our Far East will possibly add to the list of birds fostering Indian Cuckoos. It is not impossible that in the Amur flood-land, as in China, these birds parasitize the Azurewinged Magpies, and that, south of this river, there are nests of the Amur Brown Shrike with eggs of Indian Cuckoos in them. Hoffmann (1950) has mentioned this shrike as a possible foster-parent of the Indian Cuckoo in the parks of Peking.

The breeding period of this cuckoo is correlated with that of its main fosterers. At the end of December, near the southern borders of the breeding range, in Ceylon, Phillips (1948, 1952) found in the nest of the Blackheaded Oriole an egg which is supposed to have been laid by an Indian Cuckoo, and at the beginning of May he obtained a fledgling of this cuckoo. In different regions of India the egg-laying takes place from March-April till May-June (Baker 1927; Jones 1941; Storrs 1944; Ali 1953). Northward, in Peking and its environs, the breeding takes place in general in June. Shaw (1938) reports, for instance, the finding of a week-old cuckoo in the nest on 25 June. Hoffmann (1950) observed young Indian Cuckoos able to fly well in 1946 from 31 July to 16 August, in 1947 from 19 July to end of the month.

In the south of the Amur-Zeya plateau fresh eggs were found in 50 nests of Amur Brown Shrikes from 6 June to 30 June. Some individuals were building their nests till the middle of July. In all the cases known to me Indian Cuckoo eggs were laid also in June at the time of



the intensive breeding of the shrikes. Thus, on 8 June 1957 a cuckoo-female was obtained just after she had laid the second egg of that season (apparently the first egg was laid on 5 or 6 June); on 12 June 1962 a shrike's nest was found containing a fresh cuckoo egg, the nestling hatched on June 22 (the clutch was apparently laid on June 11); on 12 June 1961 I watched for a long time a female Indian Cuckoo try, though unsuccessfully, to enter the nest of a shrike; on 4 August 1959 I obtained a 40-day old Indian Cuckoo, and on 26 July a fledgling whose age was estimated as about 30 days (both could have hatched from eggs laid in the middle of June); on 28 June 1962 a nest was found with a fresh cuckoo egg, the nestling hatched on June 9. The gonads of all male Indian Cuckoos shot at the height of the breeding period (7-27 June) were of equal size, measuring in mm.:  $4.0 \times 4.0$  -  $6.0 \times 4.0$ , and  $4.0 \times 3.7$  -  $5.0 \times 4.0$ .

Nearly 75% of the Amur Brown Shrikes nests observed in Amurland were built on the ground, the rest at a height of 0.5-1.9 m. above the ground in bushes and trees. The Indian Cuckoo parasitized nests of both types. Its eggs were twice discovered in nests situated on the ground in dense grass and once in a nest built in the crutch of a willow bush. When looking for the nests of shrikes, females of the Indian Cuckoo as well as those of other parasitic species are guided in the first instance by the behaviour of the fosterers. The singing of male shrikes, which is usually accompanied by typical displays, as well as the loud call notes of these birds attracted the Indian Cuckoos to their nest. Later, cuckoo-hens watch the birds in the process of nest-building or discover their nests by the alarm-calls or behaviour of the host. To begin with, cuckoos apparently discover the less disguised nests and the nests of those individuals who by their high excitability and carelessness attract the cuckoo's attention.

On 12 June 1961 I watched a female Indian Cuckoo, perched in the low branches of an old larch on the outskirts of the forest, looking very attentively at a thicket near which a male shrike frightened by me was flying. For a long time she remained unnoticed, but the moment she made a careless movement the shrike noticed her. With a loud call he attacked her and pressed the attack till she left the territory. So the nest built in a heap of dead branches and containing a fresh clutch was not discovered by the cuckoo.

When laying in a nest found beforehand the cuckoo-hen acts with confidence and most persistently. Thus on 8 June 1957 during a trip my attention was attracted by a male shrike flying in agitation near his nest containing fresh eggs. Through binoculars I could make out that he was trying to drive away a rather large bird, an Indian Cuckoo female, perched on the branch of a dry willow bush. In 15-20 minutes the cuckoo flew on to a fragment of a larch branch lying on the ground at



Neufeldt : Indian Cuckoo



*Above : Nest with complete clutch of Amur Brown Shrike eggs and one Indian Cuckoo egg ; Below : Two-day old nestling of Indian Cuckoo in the nest.*

*(Photos : I. Neufeldt)*



Neufeldt : Indian Cuckoo



*Above : Amur Brown Shrike female brooding 7-day old Indian Cuckoo ; Below : Same bird with food for young cuckoo.*

*( Photos : I. Neufeldt )*

1.5 m. distance from the nest. The frightened female shrike immediately left the nest and joined her mate. Looking round but paying no attention to her attacking hosts the cuckoo reached the nest. In 20-30 seconds she flew away from the nest leaving her egg there.

Complete clutches of the Amur Brown Shrike consist usually of 6-7 and sometimes 4-5 eggs, in some nests we found only 3 eggs—the last apparently a case of second laying. In one nest containing 6 eggs, an Indian Cuckoo laid her egg, leaving host's clutch untouched. In two other nests used by these cuckoos we found only 3-5 eggs. It is difficult to say whether cuckoos were to blame or they had laid their eggs in nests with incomplete clutches. It is of interest that, analyzing the stomach contents of Indian Cuckoos collected in China, Shaw & Liu (1940) found the shells and inner shell membranes of a bird's egg. Apparently, this cuckoo as well as the Common Cuckoo sometimes carry off and swallow eggs from their fosterers' nests. In all cases known to me Indian Cuckoos laid their eggs in nest which contained full fresh clutches. Judging by the behaviour of the cuckoos in their territory and by the changes in the activity of males and females during the breeding season the eggs are normally laid at intervals of 1.5-2 days. I do not know the number of eggs laid by one female in one summer, but I think this species lacks the high fertility usually attributed to Common Cuckoo females. If one Indian Cuckoo female could lay 25-20 or even 15 eggs in a summer, at least every second shrike nest examined by me should have contained a cuckoo egg, but actually it was otherwise.

The Indian Cuckoo eggs found in the nests of Amur Brown Shrikes are mimetic. In two cases they practically did not differ in pattern, coloration, and shape from fosterers' eggs. They had a dirty-white, slightly greenish ground colour with beige surface and deeper grey spots and speckles concentrated near the blunt end of the egg thus forming a nimbus-like thickening (Plate I, *above*). The third egg found in the shrike's nest had a pink background mottled with darker greyish brown spots and somewhat different in coloration from the two preceding eggs. Thus, in Amurland according to the coloration of the eggs Indian Cuckoos may be arranged in two groups corresponding to the two types of pigmentation of their fosterers' eggs. In general, the eggs of these cuckoo parasites of the shrikes resemble by coloration the eggs of Azurewinged Magpies, Drongos, and even Streaked Spiderhunters, birds known as Indian Cuckoo host-species in other parts of the area. The eggs of the Indian Cuckoo are larger than those of the Amur Brown Shrike, the measurements (in mm.) being:

Nest No. 1—*Shrike*:  $20.0 \times 17.0$  (2),  $21.5 \times 16.7$ ,  $21.6 \times 17.0$ ,  $22.0 \times 17.2$ ,  $23.0 \times 17.0$ , average  $21.4 \times 16.98$ ; *Cuckoo*:  $25.0 \times 19.0$ .



Nest No. 2—*Shrike* :  $23.0 \times 17.0$ ,  $23.5 \times 17.0$ ,  $23.5 \times 17.5$ , average  $23.3 \times 17.1$  ; *Cuckoo* :  $26.0 \times 20.0$ .

Nest No. 3—*Shrike* :  $20.5 \times 16.5$  (3),  $21.0 \times 16.5$  (2), average  $20.7 \times 16.5$  ; *Cuckoo* :  $25.0 \times 19.5$ .

The shell surface of fresh Indian Cuckoo eggs is matt but on hatching it acquires a faint lustre.

In all cases known to me shrikes did not notice the increase of the number of eggs in the nest and readily accepted the larger and roundish cuckoo eggs.

Indian Cuckoo eggs hatch in about 12 days, whereas the shrike eggs require 14 days. The cuckoo nestlings always hatch before the fosterers'. The hatching sometimes lasts long. Thus, in one nest cracks on the cuckoo-egg were recorded on 8 July at 18 hrs. and the chick emerged only between 9 and 10 hrs. on 9 July. Whenever cuckoo-females laid their eggs before midday, usually in the morning, the hatching also took place in the morning.

The newly-hatched Indian Cuckoo chick is blind and naked, with closed acoustic ducts ; skin on the body, bill, nostrils, and legs yellowish pink ; tongue (except the very tip) and inside mouth orange-red ; commissures of the jaw and tip of the tongue yellow—even at this age the chicks differ from Common and Himalayan Cuckoos' chicks in having a lighter tip to the tongue. Immediately on hatching, the chick weighs 4.7-4.9 gm.

In the one-day old chick the acoustic ducts are open and the skin on the dorsal part of the body and on the legs is darker. The two-day old is very limp and lies cheeping quietly at the bottom of the nest (Plate I, below). Only on strong tactile irritation of the rump skin does the blind nestling strike a rather typical ejection attitude. It stands up with legs wide apart, throws its wings well back, and bends its neck down setting the top of the head against the nest bottom. Contact with eggs or newly-hatched fosterers' chicks does not cause this reaction. The actual ejection takes place on the third and partly on the fourth day ; after this period the ' overboard ' instinct gradually disappears.

On the third day in the region of the future remiges and rectrices there appear hardly visible ' hairs ', which may be regarded as rudiments of ancestral nestling ' down '. It is known that only non-parasitic cuckoo-chicks (*Centropus*, *Geococcyx*, *Coccyzus*, etc.) have ' down '. Shelford's (1900) investigations have shown that these thread-like structures (trichoptiles) are not down, but abnormally elongated apexes of horny sheaths enveloping growing feathers. With the growth of a feather papilla trichoptilia lengthen as well. When feathers begin to unfold the trichoptilia break off. I think that the degeneration of the thread-like structures in parasitic cuckoo nestlings is of an adaptive nature, tactile receptors in a naked skin being more sensitive and easily provok-



ing a reflex act of ejection. On the fourth or fifth day appear the first feathers on the nape and shoulders, and then on the forehead, ulnar, carpal, and femur regions; the eyes half open; the skin of the dorsal surface of the head, body, and wings as well as the bill and tip of the tongue grow darker and become dark-grey with a violet shade. Now the Indian Cuckoo chick differs very well from those of the Common and Himalayan Cuckoos, not only in tongue colour but also in the colour of the feather sheaths, the tapering apexes of the undeveloped feathers being beige or pale-yellow in colour in the Indian Cuckoo while in the two other species they have white or slightly greyish distal poles.

In the 7-day old Indian Cuckoo the eyes are entirely open, feather papillae grow over all the pterygiae except the dorsal one, the caudal portion of the ventral one, and some parts of the head (Plate II, *above*). The week-old juvenile weighs eight times the newly hatched one. It is still poikilothermal and is constantly brooded by the host-hen. While sitting in the nest the cuckoo cheeps quietly and even when hungry does not utter loud calls. Sometimes it tries, though rather clumsily, to preen.

On 8th day the feathers on the nape, shoulders, thighs, and greater wing-coverts begin to unfold; the eyes are entirely open, though in the nest the chick prefers to keep them closed; the bill flanges, nostrils, and the tip of the tongue become black. The nestling weighs 40-45 gm., i.e. more than an adult Amur Brown Shrike. The length of the second primary is 13-15 mm. and the second rectrix 5-6 mm.

By 9-10 days of age nearly all the feathers emerge from their sheaths; there remain in papillae only the feathers on the crown, the forehead, and the rump, corresponding to the parts of the body with high sensitivity in the 2- to 3-day old nestling. The wing-coverts as well as the first feathers on the nape and thigh have rather large vanes. The skin on the dorsal, the most exposed side of the body is dark, whereas abdominally it is a pale pinkish yellow.

At the approach of a man the 10- to 11-day old cuckoo produces some threat gestures: ruffles its feathers on the head, opens its wings, raises the tail, and tries to peck. The foster parents still continue to brood the nestling.

12-day old chick weighs 73-75 gm., the second primary is 41 mm. the second rectrix 24 mm. All feathers unfold; only the lores and feathers near the orbital ring remain in sheaths. From the age of 12 days regular brooding of the nestling ceases. When its shrike-hosts are absent the young cuckoo sits very quietly in the nest, sometimes preening, raising, and stretching itself. It constantly cheeps without opening its bill. When hungry it screams out its shrill *tu-fju*. On hearing or seeing its foster-parents approaching with food the nestling calls louder, opens its bill, and shakes its wings (Plate III, *above*). At the moment of

taking the food the cuckoo-chick cheeps and trembles all over. In general, all vocal reactions of the young Indian Cuckoo are very similar to those of the young Common Cuckoo but somewhat muffled and low. The female shrike for some unknown reason fed the chick of the Indian Cuckoo less willingly than the males did. Sometimes they did not feed them at all. In such cases young cuckoos readily recognized the male bird and responded only to its calls. Usually, in the nestlings of the Indian Cuckoo and of many passerine birds, each discharge of excrement is enclosed in a gelatinous capsule (faecal sac) so that it can be removed by the parents. It is of interest that the droppings of nestlings of the non-parasitic cuckoos are not encapsuled. However, you have only to touch the Indian Cuckoo chick or take it in the hand for it instantly splashes you over with a large excretion of brown stinking liquid. Thus, at this age the young cuckoo is capable of actively protecting itself from enemies.

When 14 days old the Indian Cuckoo is rather well feathered (Plate III, *below*) though the bases of all the feathers are more or less concealed in feather sheaths. When in the nest the young cuckoo closely watches its foster parents bringing food and actively gets the food from them. It was quite indifferent to calls of the male and female Indian Cuckoos. When the shrikes are out of the nest it raises, stretches, and cleans itself.

On the 18th day the young cuckoo tried to perch on the edge of the nest. When three weeks old it left the nest and perched on a high stump (Plate IV); the remiges, rectrices, and the majority of the small feathers had not reached normal length and the cuckoo was not capable of active flight. Its weight after leaving the nest was 90 gm.

In captivity the Indian Cuckoo chick grows to adult size and acquires the complete juvenile plumage at the age of 45 days (Shaw 1940). According to my data the 30-to 40-day old cuckoo is airborne and does not differ from adults in size, but still continues to beg for food from the foster parents. From shrubs growing on the edge of the forest or from the glade where it hatched and grew up, the chick now moves into the heart of the forest. The shrikes follow it rather unwillingly in this change from their habitual biotope and try to lure it out in every possible way. When hungry the cuckoo flies to the forest edge and perches on a low branch or stump, where it receives food. When perching or flying the juvenile Indian Cuckoo utters in succession low and rather tuneful calls, a kind of *tu-fju*, *tu-fju*. At the moment of feeding it utters sounds resembling the hunger cry of the foster parents' chicks. Flying from place to place a frightened young cuckoo produced a loud ringing warble resembling that of the juvenile Common Cuckoo. Fledglings of the Indian Cuckoo at the age of one month weighed 119.5 and 127.0 gm., the same weight as adults. The weight of adult birds collected in



Neufeldt : Indian Cuckoo



*Above : 13-day old Indian Cuckoo begs for food ; Below : 14-day old Indian Cuckoo in Amur Brown Shrike nest.*

*(Photos : I. Neufeldt)*



Neufeldt : Indian Cuckoo



Young Indian Cuckoo newly out of nest being fed by foster-parent, an Amur Brown Shrike.

(Photo : I. Neufeldt)



Amurland was as follows: ♂♂ 112·0, 114·0, 115·0, 120·0, 124·0, 129·0 gm.; ♀ 119·0 gm.

The coloration of the Indian Cuckoo's juvenile plumage is so peculiar that young birds of this species cannot be confused with the chicks of any other cuckoo. The difference from the adult plumage is the absence of pure white colour and of various grey tints, and in the predominance of dirty cream, isabelline, dark-brown, and ferrugineous shades. The plumage of the upper part of the head (besides the crown), hindneck, and throat is basally black with broad isabelline apical bands. On the forehead, along the mouth, and around the eyes and ear-coverts the feathers are entirely black with a light base and black apex. The lower throat of the juvenile is also black with considerably longer covering feathers and has an additional black stripe against an isabelline background. By such coloration of some feathers in the lower part of the lower throat sparse transverse bars are outlined and the lower throat itself looks considerably darker. The plumage of the belly has a pure isabelline coloration and only the under tail-coverts sometimes have black markings. On the flanks and the breast grow feathers bearing two rather broad dark transverse bars on isabelline vanes. Those which are situated nearest to base are usually concealed by the apex of overlapping neighbouring feathers. Apical bars are distinctly seen; they impart typical cross-barred coloration to the underpart of young cuckoos (Plate IV). On the dorsal side isabelline or a paler colour stretches, except for the head and hindneck, to the apexes of some scapulars and to the ends of all the tail feathers. The crown and rump juvenile feathers grow later than the rest of the plumage and are dark-brown with ferrugineous apical bars and transverse stripes and speckles on the inner and outer webs, with a hardly noticeable purple shade. The primaries are of the same colour, their inner webs barred with ferrugineous. The ends of all the wing feathers are ochre-fulvous. The wing-coverts are dark brown with ochre apexes and spots or stripes of the same colour on the vanes. All the rectrices are greyish brown, and the preapical part black with transverse ferrugineous bars. The central part of each feather bears against each stripe hardly noticeable depigmented spots. The orbital ring is yellow, the legs flesh-pink, the iris dark-brown, the tongue and the inside of the mouth salmon-orange, the tip of the tongue black, the upper mandible, margins of the eyelids, and the nostrils black, the under mandible of horny colour darkening to the apex.

The food given to the young Indian Cuckoo is identical with that used by the foster parents themselves. Grasshoppers and locusts of various size, caterpillars and imagines of moths (Noctuidae, Geometridae) and sphinxes (Sphingidae) predominated in the diet (Plate IV). Gaily-coloured butterflies such as *Vanessa urticae* and *Papilio xuthus* were recorded as food at that time. The shrikes pick up small beetles